3. (Amended) The electrode structure as claimed in claim 2, further including an insulating member provided between said electrode unit and said cooling block, and wherein said heat transfer space is divided into an upper space and a lower space by the thermally insulating member.

A1 4. (Amended) The electrode structure as claimed in claim 3, wherein said thermally insulating member is made of a material having a coefficient of thermal conductivity of more than 80 W/mK at a process temperature of said object to be processed.

A2 7. (Amended) The electrode structure as claimed in claim 2, wherein a surface roughness of a member defining said heat transfer space is smaller than 2.0 μm.

A3 11. (Amended) An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure, comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space, wherein a surface of said heat resistant metal seal member is covered by a fluoride passivation film having a corrosion resistance with respect a fluoride gas.

12. (Amended) The electrode structure as claimed in claim 11, wherein said fluoride passivation film is made of nickel fluoride.

13. (Amended) The electrode structure as claimed in claim 2, wherein said heater unit is a ceramic heater.

A4 15. (Amended) The electrode structure as claimed in claim 2, wherein said electrode unit is an upper electrode unit positioned above said object to be processed.

21. (Amended) The placement table structure as claimed in claim 20, wherein a surface of said heat resistant metal seal member is covered by a soft metal film made of a material having a softening point lower than a process temperature of said object to be processed which is softened at a process temperature of said object to be processed.

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22. (Amended) The placement table structure as claimed in claim 20, wherein a surface of a member contacting said heat resistant metal seal member is covered by a soft metal layer made of a low melting point material which is softened at a process temperature of said object to be processed.

23. (Amended) A placement table structure used for a processing apparatus performing a predetermined process on an object to be processed in a process chamber in which a vacuum can be formed, the placement table structure including:

a placement table having a heater unit therein so as to heat said object to be processed;

a cooling block joined to the placement table and having a cooling jacket which cools said placement table;

a heat resistant metal seal member for sealing a heat transfer space formed between said placement table and said cooling block; and

heat transfer gas supply means for supplying a heat transfer gas to said heat transfer space,

wherein a surface of said heat resistant metal seal member is covered by a fluoride passivation film having a corrosion resistance with respect a fluoride gas.

24. (Amended) The placement table structure as claimed in claim 23, wherein said fluoride passivation film is made of nickel fluoride.

25. (Amended) A placement table structure used for a processing apparatus performing a predetermined process on an object to be processed in a process chamber in which a vacuum can be formed, the placement table structure comprising:

a placement table having a heater unit therein so as to heat said object to be processed;

a cooling block joined to the placement table and having a cooling jacket which cools said placement table;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said placement table and said cooling block; and

heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space.

27. (Amended) The placement table structure as claimed in claim 25 or 44, wherein a surface roughness of a member defining said heat-transfer space is smaller than 2.0 μm.

29. (Amended) The placement table structure as claimed in claim 25, wherein the center of said placement table is held by a column, and the column is connected to said cooling block via a heat conductive member.

30. (Amended) A plasma processing apparatus comprising:

a process chamber in which a vacuum can be formed;

an electrode structure recited in one of claims 2, 3, 4, 7, 11, 12, 13, 15, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 and 43; and

a high-frequency source applying a high-frequency voltage to the electrode structure.

31. (Amended) A processing apparatus comprising:

a process chamber in which a vacuum can be formed; and

a placement table structure recited in one of claims 23, 24, 25, 27 and 29.

See the attached Appendix for the changes made to effect the above claim(s).

Please add the following new claims:

Please add the following new claims

--32. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure, comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block;

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space; and

an aluminum nitride (AlN) thermally insulating member provided between said electrode unit and said cooling block, said heat transfer space is divided into an upper space and a lower space by the thermally insulating member, said thermally insulating member having a coefficient of thermal conductivity of more than 80 W/mK at a process temperature of said object to be processed.

33. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

A8

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block;

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space; and

an aluminum nitride (AlN) thermally insulating member provided between said electrode unit and said cooling block, the heat transfer space being divided into an upper space and a lower space by the thermally insulating member, said thermally insulating member having a coefficient of thermal conductivity of more than 80 W/mK at a process temperature of said object to be processed.

34. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space, wherein a contact rate of a joining surface of a member,

✓ 1.70

which is joined to define said heat transfer space, is set to fall within a range from 40% to 80%.

35. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure, comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space, wherein a contact rate of a joining surface of a member, which is joined to define said heat transfer space, is set to fall within a range from 40% to 80%.

36. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure, comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket (58; 126) which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space, wherein said heater unit is divided into concentric zones, and the divided zones are controllable on an individual basis.

37. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space, wherein said heater unit is divided into concentric zones, and the divided zones are controllable on an individual basis.

38. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space,

wherein said electrode unit is a lower electrode unit which also serves as a placement table on which said object to be processed is placed, and the electrode structure further comprises an electrostatic chuck which is joined to an upper surface of the lower electrode unit so as to attract said object to be processed and a chuck-side heat transfer gas supply means for supplying a heat transfer gas to a chuck-side heat transfer space formed between said electrostatic chuck and said object to be processed.

39. The electrode structure as claimed in claim 38 wherein at least one of said electrodeside heat transfer space, said labyrinth heat transfer space and said chuck-side heat transfer space is provided with a heat resistant pressure sensor, and an amount of gas supplied by said corresponding heat transfer gas supply means is controlled based on an output of the heat resistant pressure sensor.

40. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space,

wherein said electrode unit is a lower electrode unit which also serves as a placement table on which said object to be processed is placed, and the electrode structure further comprises an electrostatic chuck which is joined to an upper surface of the lower electrode unit so as to attract said object to be processed and a chuck-side heat transfer gas supply means for supplying a heat transfer gas to a chuck-side heat transfer space formed between said electrostatic chuck and said object to be processed.

41. The electrode structure as claimed in claim 40 wherein at least one of said electrodeside heat transfer space, said labyrinth heat transfer space and said chuck-side heat transfer space is provided with a heat resistant pressure sensor, and an amount of gas supplied by said corresponding heat transfer gas supply means is controlled based on an output of the heat resistant pressure sensor.

42. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a heat resistant metal seal member for sealing an electrode-side heat transfer space formed between said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said electrode-side heat transfer space,

wherein the center of said electrode unit is held by a hollow column, and gas blower means is provided in said column for promoting a release of heat by blowing a gas toward the center of a back surface of said electrode unit.

43. An electrode structure used in a plasma processing apparatus which performs a predetermined process on an object to be processed by using a plasma in a process chamber in which a vacuum can be formed, the electrode structure comprising:

an electrode unit having a heater unit therein;

a cooling block joined to the electrode unit and having a cooling jacket which cools said electrode unit;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said electrode unit and said cooling block; and

electrode-side heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space,

wherein the center of said electrode unit is held by a hollow column, and gas blower means is provided in said column for promoting a release of heat by blowing a gas toward the center of a back surface of said electrode unit.

44. A placement table structure used for a processing apparatus performing a predetermined process on an object to be processed in a process chamber in which a vacuum can be formed, the placement table structure comprising:

a placement table having a heater unit therein so as to heat said object to be processed;

a cooling block joined to the placement table and having a cooling jacket which cools said placement table;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said placement table and said cooling block; and

heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space,

wherein a rate of contact of a joining surface of a member joined to define said heat transfer space is set to fall within a range from 40% to 80%.

45. A placement table structure used for a processing apparatus performing a predetermined process on an object to be processed in a process chamber in which a vacuum can be formed, the placement table structure comprising:

a placement table having a heater unit therein so as to heat said object to be processed;

a cooling block joined to the placement table and having a cooling jacket which cools said placement table;

a labyrinth heat transfer space formed by a concentric or spiral groove provided on at least one of opposite surfaces of said placement table and said cooling block; and

heat transfer gas supply means for supplying a heat transfer gas to said labyrinth heat transfer space,

wherein the center of said placement table is held by a hollow column, and gas blower means is provided in said column for promoting a release of heat by blowing a gas toward the center of a back surface of said electrode unit.--